Modulating light emission in a spin-OLED through spin injection at high voltages

H. Prima-García,[a] J.P. Prieto-Ruiz,[a] S.Gómez-Miralles,[a] A. Riminucci,[b] P. Graziossi[b], V. A. Dediu,[b] E. Coronado, *[a]

[a]Instituto de Ciencia Molecular (ICMol), Universidad de Valencia

[b] Instituto per lo Studio dei Materiali Nanostrutturati ISMN - CNR, Via Gobetti, 101, Bologna, 40129, Italy

Spin-based electronics is one of the emerging branches in today's nanotechnology and the most active area within nanomagnetism. So far spintronics has been based on conventional materials like inorganic metals and semiconductors. Still, an appealing possibility is that of using molecule-based materials, as components of new spintronic systems [1]. In particular, by taking advantage of a hybrid approach one can integrate molecular materials showing multifunctional properties into spintronic devices. In this talk we illustrate the use of this approach to fabricate multifunctional molecular devices combining light and spin-valve properties (i.e., Spin-OLEDs). So far only one report has been published which is based on the fabrication of an organic light emitting diode (OLED) with ferromagnetic electrodes [2]. Our approach is based on the use of a HyLED (Hybrid Light Emitting Diode) structure in which LSMO and Co are used as ferromagnetic electrode. This device works simultaneously as a spin valve and an electroluminescent device at low temperatures [3]. This new approach leads to a robust organic luminescent device in which light emission can be enhanced and modulated upon application of an external magnetic field (Figure 1)

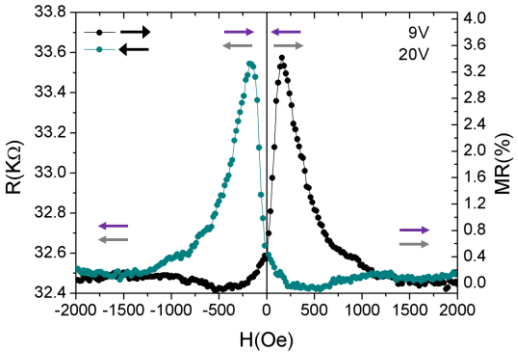

Figure 1. *Magnetoresistance at 9 V and 20K of the PEIE SO. Black arrows depict the field sweep direction. Purple and grey arrows point the FM electrodes magnetization direction.*

Molecular Spintronic, Spin-OLEDs, multifunctional devices

References

[1] J. Camarero, E. Coronado, J. Mater. Chem. **19**, 1678 (2009).
[2] T. Nguyen, E. Ehrenfreud, Z. Valy Vardeny, Science **337**, 204 (2012).
[3] Opto-spintronic device and its fabrication method.E. Coronado Miralles; H. Prima Garcia, J.P. Prieto Ruiz. Spanish National Patent. **Ref. 201300083**, 2013, University of Valencia.